

EXPRESS 168 AND 140 AS PRODUCT OF ITS

PRIME FACTORS

For prime numbers only. (2, 3, 5, 7, 11, 13, ...)

2	168
2	84
2	42
3	21
7	7
	1

2	140
2	70
5	35
7	7
	1

$$168 = \overset{\text{Loops}}{2} \times \overset{\text{Loops}}{2} \times \overset{\text{Discs}}{2} \times 3 \times 7 = 2^3 \times 3 \times 7$$

$$140 = 2 \times 2 \times 5 \times 7 = 2^2 \times 5 \times 7$$

Q: Find HCF & LCM OF 168 and 140.

$$\text{HCF: (Loop only)} = 2 \times 2 \times 7 = 28$$

LCM: (Loops and discs)

$$= 2 \times 2 \times 7 \times 2 \times 3 \times 5$$

$$= 840$$

i) Find smallest integer n such that 168n is multiple of 140.

$$\frac{168n}{140} = \frac{(\cancel{2} \times \cancel{2} \times 2 \times 3 \times \cancel{7})}{\cancel{2} \times \cancel{2} \times 5 \times \cancel{7}} \boxed{5}$$

$$\boxed{n = 5}$$

Concept..

12 is multiple of 4
(True)

$\frac{12}{4} = 3$
All denominator must cancel.

ii) Find smallest integer n such that 140n is multiple of 168.

$$\frac{140n}{168} = \frac{(\cancel{2} \times \cancel{2} \times 5 \times \cancel{7})}{\cancel{2} \times \cancel{2} \times 2 \times 3 \times \cancel{7}} \boxed{2 \times 3}$$

$$n = 2 \times 3 = 6$$

(iii) Find smallest integer k such that $168k$ is a perfect square.

$$168k = (2 \times 2 \times 2 \times 3 \times 7) \boxed{2 \ 3 \ 7}$$

pair
↓
😊

$$k = 2 \times 3 \times 7 = 42$$

Factors of square numbers live as pairs of two. (Twins)

(iv) Find smallest integer k such that $168k$ is a perfect cube

$$168k = (2 \times 2 \times 2 \times 3 \times 7) \boxed{3 \times 3 \times 7 \times 7}$$

Triplet
↓
😊

$$k = 3 \times 3 \times 7 \times 7$$

$$k = 441$$

Factors of cube numbers live in groups of three (Triplets)

ADVANCED:

Q. It is given that HCF of $96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$ and another number N is $2^3 \times 3$. Given that N is less than 96, Find greatest value of N . (1 mark)

$$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$N = \boxed{2 \times 2 \times 2 \times 3} \times 3 = 72$$

$$\text{HCF} = 2 \times 2 \times 2 \times 3$$

$$\boxed{N = 72}$$

When HCF is given

ALWAYS GREATEST VALUE

- 1) Copy whole HCF to box of N
- 2) Now multiply new ^{prime} values in box of N and New values must not make a new loop. The total should not exceed range given in question

Q. Given that LCM of $A = 2^2 \times 5^2 \times 7$ and another number N, is $2^2 \times 3 \times 5^3 \times 7$. Find the Least value of N.

$$A = 2 \times 2 \times 5 \times 5 \times 7$$

$$N = \begin{array}{|c|c|c|c|c|c|} \hline \text{No} & 3 & 5 & 5 & 5 & \text{No} \\ \hline \text{Two} & & & & & 7 \\ \hline \end{array}$$

$$\text{LCM} = 2 \times 2 \times 3 \times 5 \times 5 \times 5 \times 7$$

$$N = 3 \times 5 \times 5 \times 5$$

$$N = 375$$

Note: 1) If the no of factors are same in A and LCM, ignore these in N.

2) If the no of factors in A and LCM are different, copy the no of factors from LCM to N.

(b) The lowest common multiple of $\underbrace{2^2 \times 5^2 \times 7}_A$ and another number, N , is $\underbrace{2^2 \times 3 \times 5^2 \times 7^2}_{\text{LCM}}$.

Find the lowest possible value of N .

$$A = (2 \times 2) \times (5 \times 5) \times (7)$$

$$N = \begin{array}{|c|c|c|c|} \hline \text{No} & 3 & \text{No} & 7 \times 7 \\ \hline \text{Two} & & \text{Fives} & \\ \hline \end{array} = 3 \times 7 \times 7 = 147$$

$$\text{LCM} = (2 \times 2) \times (3) \times (5 \times 5) \times (7 \times 7)$$

Answer $N = 147$ [1]